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ABSTRACT

A 9-month study of a 1-year-old child's acquisition of the pronunciation of "camera" is presented. The data show that while the child can articulate and perceive all the phonological segments of the adult form, she uses an idiosyncratic child-based form when she spontaneously draws from her lexicon to produce an utterance, systematically modifying it when she perceives the necessity to bring it closer to the adult convention. This suggests that she is using two forms: the dynamic, child-based form used for production and the stable adult-based form she uses for comprehension. This evidence supports the theory that children use both auditory and articulatory underlying representations. However, the theory that the child's variant forms are subject to output rules is rejected in favor of the idea that they are drawn straight from the child's lexicon. (MSE)

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MORE EVIDENCE ON CHILDREN'S UNDERLYING PHONOLOGICAL REPRESENTATIONS: ARE THEY ADULT OR CHILD BASED?

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Since Kornfeld's (1971) notions, lexical representation seems to have polarized around two models; children's representations are either adult-based (Clark & Clark, 1977), Kornfeld's null hypothesis, or child-based (ibid.), Kornfeld's alternative hypothesis. The danger of this kind of polarization is that it gives the impression that there is no middle ground between the poles. This view was not voiced in Kornfeld's paper.

Following Stampe (1969), Clark & Clark (1977) present the argument that the reported evidence on phonological representations overwhelmingly supports the adult-based model. Yet there is also evidence which indicates that this is not the only valid view (see Morton & Smith, 1974; Braine, 1976; Macken, 1980; Kuczaj, 1983). In this paper I will present more data to support the contention that there is room for compromise between the two opposing models.

The foundations of the adult-based model, or articulatory model as Braine (1976) calls it, can be seen in the work of Berko & Brown (1960), which reported what has become known as the fis-phenomenon and clearly demonstrated that children are able to recognize words which they cannot pronounce. This has been taken as evidence that their underlying phonological representations must bear a closer resemblance to the adult word than they do to the child's own pronunciations.

Corroboration of the fis-phenomenon was provided by Smith (1973, 1975) who presented a very strong case for the argument that children's underlying representations are based upon adult forms. Smith (1975) contends that children's apparent deviance from the adult form is not solely based in articulatory difficulties. He argues that children can often articulate sounds as substitutes that they are unable to produce in their correct (adult) positions, (see his account of the puzzle phenomenon, 1973, p.55) and he proposes that this is a result of the application of realization rules. Braine (1976) is openly critical of Smith's stance and claims that Smith has taken up an extreme position which allows no middle ground between the two polar models.

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The alternative approach, the child-based, or perception model as Braine (1973) calls it, is exemplified by Waterson's (1971) article. Waterson states that young children are unable to perceive all the distinctions of adult speech and only encode those which they are capable of producing (1971, p.181).

The middle ground is occupied by several people. Braine (1976) proposes a three stage model consisting of auditory encoding rules, correspondence rules and articulatory output rules. He suggests that a child may have two representations for words -- an articulatory one which changes in response to the child's developing phonological ability, and an auditory one which is presumably static.

Macken (1980) asserts that in a reanalysis of Smith's (1973) data she observed that children may indeed have an underlying representation that is not based upon the adult form, but one which is based upon the 'misperception' of the adult form. Macken adapts Braine's (1976) model and reduces it to a two-level system made up of perceptual encoding rules which create the lexical entry and output rules which modify the lexical representation prior to production. Like Braine, Macken believes that there is room for alternative proposals between the two polar models. She maintains that Smith's conclusion that the underlying representations of ALL words are based upon adult forms is incorrect as some words are clearly stored in a 'non-adult-like' form. Macken concludes by raising the question of whether or not there may be other factors, unrelated to perceptual incompetence, which may account for non-adult-like representations in children's lexica.

Kuczaj (1983) re-examines the whole question of adult and/or child-based representations and concludes that his son Ben had both kinds of underlying representations. He notes that Morton & Smith (1974) had previously come to that same conclusion.

Following in the tradition of the middle ground research listed above, I propose that children use two separate but related underlying phonological representations; a stable one based upon the adult form which is used in comprehension and a dynamic, idiosyncratic form which is used in production. To support this proposal I shall now present a series of qualitative analyses of several episodes of a child's linguistic performance. The examples are drawn from a more extensive study (Higginson, 1985a); the full data set is available from the Child Language Data Exchange System.

The particular data that I have chosen to exemplify my argument deal with a child's acquisition of the word 'cam-

era' and follow her development of the word over a period of nine months. The child's pseudonym is April.

The first recorded instance of April's use of the word occurred when she was 1;10 and had her first encounter with a videocamera, see exchange 01 below:

01	Mother:	What's that? It's a camera.
	April:	Camera. [kãma]
	Mother:	Camera, yeh a camera, taking your pictures.

During this exchange April's mother acknowledges her interest in this new object by naming it for her. April uses a form based upon the adult form. April's form is a direct imitation of her mother's utterance and serves only to label the object and locate it in her lexicon.

Ten minutes later April again fixed her gaze on the camera:

02	Mother:	What's that, huh?
	April:	Camera. [kɔyə]
	Mother:	What?
	April:	Camera. [kɔ̃nə]
	Mother:	What? Camera! That's pretty close. Camera.
	April:	Camera. [kãmrə]
	Mother:	Right.

In this exchange April introduces the form [kɔyə] which bears little resemblance to her earlier utterance of the form [kãma]. She has no adult model to imitate and so this novel form must be based upon her own representation. It could be argued that [kɔyə] is the best rendition of the adult form that is available to her due to perceptual and/or articulatory difficulties. Alternatively, it could be claimed that this novel form is the result of the activation

of her realization rules (Smith, 1973). These arguments are rendered impotent, however, by the fact that April utters the form [kãmɾə] during the exchange and thereby establishes that she is capable of both perceiving and producing all of the segments of the adult form. I suggest, therefore, that [kɔyə] is based upon an idiosyncratic form that she has stored in her lexicon.

Another interesting aspect of this exchange is the manner in which she modifies the form from [kɔyə] to [kɜnə] when her first form fails to bring about a satisfactory response. The substitution of the nasal for the glide is an important modification and not just an articulatory error for the nasal remains constant in all the later episodes. The relevance of this substitution lies in the fact that it answers a question raised in the literature.

Clark and Clark (1977) wondered how children modified their child-based forms in order to align them more closely with adult conventions. The answer to Clark and Clark's question is that children modify their child-based forms themselves whenever they perceive the necessity. I have called this modification process FIXING and a full description of it can be found in Higginson 1985a.

In the previous exchange April's attention was focussed on the videocamera by her mother's question. In the following exchange, which occurred ten minutes later, April makes her first unsolicited reference to the object.

03	April:	Camera.
		[kãnʌl]
	Mother:	Right.
	(someone knocks at the door)	
		Excuse me.
		(to April)
		Yeh, the camera's taking a picture of you eating raisins.
		I'll be back in a minute.

April opened this episode by turning to look at the camera and then comments upon it to her mother. Once again she has no immediate adult model to use and so she draws upon her own child-based form. Note that the canonical form CVNVC resembles her earlier form CVNV rather than the adult-based form that she uses which is CVNCV.

April's ability to perceive and articulate all of the segments of the adult word is clearly and convincingly demonstrated in exchange 04 which occurred about two and a half minutes later:

04 Mother: Camera.
April: Camera.
[kãmrə]
Mother: Camera.
April: Camera.
[kãmrə]

This exchange provides evidence against Waterson's (1971) article which claimed that young children were unable to perceive all the distinctions of adult speech and only encode those which they were capable of producing. April has now demonstrated on two separate occasions that she can both perceive and articulate all of the segments of the adult form, yet she still produces a deviant or child-based form when she draws from her own lexicon.

Exchange 05, which occurred five minutes later, provides further evidence of the existence of both adult and child-based forms in April's lexicon.

05 April: Camera.
[kãnál]
(rising intonation)
Mother: huh?
April: Camera?
[kãnál]
(rising intonation)
Camera?
[kãnə]
(rising intonation)
Mother: Camera.
Can you say camera?
April: Camera.
[kãmrə]
Mother: Oh, ok]

The first thing to notice in this exchange is that April has returned to her canonical form CVNVC despite the fact that in the previous exchange her mother provided a model of the adult form. She has clearly drawn upon her own child-based form to create this utterance. The similarities between the two forms speak for themselves. In addition, the rising intonations and the subsequent modification to [kânə] demonstrate further processing of the child-based form in order to bring it closer to the adult form. Once again, April

provides incontravertible evidence that she can perceive and articulate all the segments of the adult form.

A review of the data presented confirms that April can articulate and perceive all the segments of the adult form. She uses a child-based form in production and that she modifies it whenever she perceives the necessity in order to bring it closer to the adult convention.

Two and a half minutes later she again referred to the videocamera:

06 (April leads her mother by the hand into the kitchen area and there she notices the rear end of the camera projecting into the kitchen space).

April: Camera?
[kãmə]
(rising intonation)
Camera?
[kãmə]
(rising intonation)

Mother: Yes, you can see the camera from this room.
What do you want?

April: Apple juice.
[æpəʃuʂ]
Apple.
[æpəl]
Apple.
[æfəl]

Mother: You want an apple, ok.
Come on let's go sit down here, then you can have your apple, ok?

April: Apple.
[æpʌl]

Mother: Now sit down.
They need to take your picture with the camera, ok.

April: Camera.
[kæ̃mə]
Me.
[mi:]

Camera.
[kə#kæ̃mə]
Mother: Camera, right.
April: Camera.
[kæ̃mə]

During this interchange April initiates the topic and uses her own form. In the course of the exchange she modifies the form from [kãnə] to [kãmə] and then modifies it again to [kæ̃mə].

When the forms used by April in the six exchanges are examined in sequence the child's idiosyncratic form is seen to become a closer and closer approximation of the adult form. The sequence of the forms is [kɔyə], [kə̃nə], [kãnʌl] [kãnál], [kãnə], [kãmə], and finally [kæ̃mə]. These modifications took place in a relatively short period of time, less than forty-five minutes, and it could be claimed that they are not intentional. Yet from this point on April used the form [kæ̃mə] without exception or alteration until the conclusion of the study thirteen months later and still continued to use it two years later.

Her continued use of the form is exemplified in exchange 07 which was recorded nine months later.

07 Mother and Roy are trying to coerce April into saying the word 'camera'.
Roy: April, what's Dean got?
(Dean is the camera operator)
Mother: Do you know what that is?
What's he looking through?
Do you remember what that is?
April: <It's a moviecamera.>
[əsə̃muvikæmə]
Mother: <What is it, can you tell me?>

On this occasion April uses the form in the compound 'moviecamera' which indicates that she can apply her child-based form in syntagmatic relations. I have no evidence of the final modification of the form from [kæ̃mə] to the adult convention but simple logic implies that at some future point that final step will be taken.

These data present the crux of my argument. April uses an idiosyncratic child-based form when she spontaneously draws from her lexicon for the purpose of producing an utterance. The child-based form is sytematically modified using a process I have called fixing until it is in accord

with the adult form. At that point I conjecture that the child-based form she uses for production is merged with the form she uses for comprehension. As the argument that children use an adult-based form is so strongly documented, and my own data so clearly demonstrate that April also makes use of child-based forms, I must conclude that she is making use of two forms; a stable, adult-based form for comprehension and a dynamic, child-based form for production.

The use of two forms, one for comprehension and one for production, is parallel with Braine's (1976) suggestion that children use both auditory and articulatory underlying representations. Braine's review expresses only a theoretical view. This paper provides empirical evidence to support Braine's theorizing.

Admitting the existence of two different underlying representations allows one to answer the two questions raised by Clark and Clark (1977). Children understand adult speech because they use the adult-based form for comprehension, and they bring their child-based production forms into alignment with adult speech through a gradual process of modification which I have called fixing. My views about the fixing process are in accord with Macken's proposal (1980) that there are factors other than perceptual ones which create 'non-adult-like' forms in children's lexica. I differ from Macken, however, by proposing that the variant forms used by the child in production are drawn straight from the child's lexicon without being subjected to output rules.

In conclusion, I propose that children use both adult and child-based underlying phonological representations; a stable adult-based form for the purpose of comprehension and a dynamic, child-based form for production.

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